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ABSTRACT

The Stanford Reading and Television Study was undertaken to research the relationship between children's television viewing and their acquisition of reading skills. This progress report outlines the design of the study, describes the nature of the data which were collected, and summarizes key analyses of the data. The results reported indicate a consistent and significant (albeit relatively weak), negative relationship between television viewing and reading achievement. A hypothesized displacement of reading time by television was not supported, nor was a hypothesized relationship between the family media environment and students' reading achievement supported for the full sample of children in the study. Finally, current objectives and future directions in research are outlined, and analyses of the relationship between television viewing and attitudes toward school are briefly discussed. Tables of supporting data are appended. (Author/SRT)

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THE STANFORD READING AND TELEVISION STUDY:

A Progress Report

Vincent Price, David Ritchie, Donald F. Roberts and Debra Lieberman*

Institute for Communication Research
Stanford University
Stanford, CA 94305
(415) 723-3696

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THE STANFORD READING AND TELEVISION STUDY:
A Progress Report

ABSTRACT

The Stanford Reading and Television Study, begun in 1981 by the Institute for Communication Research at Stanford University, was undertaken to research the relationship between children's television viewing and their acquisition of reading skills. This progress report outlines the design of the study, describes the nature of the data which were collected, and summarizes key analyses of the data. These included cross-sectional and over-time analyses, which converge on several general conclusions and provide the foundation for ongoing research.

A consistent and significant (albeit relatively weak), negative relationship between television viewing and reading achievement has been found, and this relationship holds both overtime and under controls for prior levels of reading achievement. An hypothesized displacement of reading time by television has not been supported. Nor has an hypothesized relationship between the family media environment and students' reading achievement been supported for the full sample of children in the study.

Current objectives and future directions in research are outlined. Analyses of the relationship between television viewing and attitudes toward school, now underway, are briefly discussed. Longer-range research plans include analyzing the relationships between computer use, other media behaviors, and school achievement, and investigating the social ecology of children's media use within the family.

How does television effect the development of reading skills in children? The relationship between children's television viewing and school performance, especially reading achievement, has been of interest to media researchers for nearly three decades. In a series of studies extending over those thirty years it has often been suggested that higher rates of television use are associated with lower levels of reading achievement. Yet the findings are not clear-cut. In 23 studies reviewed by Williams et al. (1982), correlations between the total amount of television viewing and various measures of reading achievement ranged from .50 to -.98, the bulk falling between .30 and -.40 with a mean correlation quite close to zero. Moreover, many of the earlier findings of strong, negative association were based on simple bivariate correlations. As Hornik (1981) notes, once controls are introduced for IQ and socioeconomic status, the relationship attenuates or disappears.

Hornik suggests three possible explanations for the scarcity of significant findings. First, the ubiquity of television makes clear empirical comparisons extremely difficult. It is virtually impossible to find areas in the industrialized world in which more than a handful of children have not been extensively exposed to television. Second, the various component effects of television use—some of which may be stongly negative, others strongly positive—may in effect cancel each other out. Third, large effects on certain subgroups of children may be masked by an overall relationship which appears rather weak.

Hornik's (1981) review of the empirical literature in this area, however, turned up few studies that have gone beyond reporting two-variable relationships, and found very little attention

to researching the numerous mediating processes that underlie the relationship between television viewing and reading development. As Roberts et al. (1984) point out, few studies have paid much conceptual attention to either of the two principle variables. Most previous research has relied on overly simplistic measures of print and television use—measures which generally fail to account for mediating influences of the home environment, child and parental orientations toward television viewing and reading, and the child's involvement with television and print media.

In 1981, the Institute for Communication Research at Stanford, supported by a grant from the John and Mary R. Markle Foundation, began a three-year panel study of the relationship between television use and reading achievement under the supervision of Professor Donald Roberts, principle investigator. Three major theoretical interests have guided the study.

First, a more detailed understanding of the nature of children's experience with media was sought through the investigation of their attitudes toward television and print media and their social and intellectual uses of both reading and viewing. In other words, the association between reading and television was to be explored, not as any simple connection, but as a function of a number of influential variables within the larger context of children's reading and television behavior.

Second, the study aimed at going beyond exploring the association of television watching and reading ability to investigate causal linkages between children's TV viewing and their reading development. Toward this end, an over-time panel design was employed. Because the same respondents were surveyed at several points in time, the relationships between measures over time could be investigated, thereby providing empirical evidence bearing on the nature of causal connections between variables.

Finally, the study attempted to account for the developmental nature of children's reading abilities. Given documented developmental changes in various television behaviors as well (Comstock et al., 1978), it was assumed that a child's developmental progress in both arenas would have profound implications on the nature of the television and reading relationship. For

this reason, children from grades two through eight were included in the research, providing respondents who were just beginning to learn letters and mastering the alphabet as well as some who were possibly reading *Moby Dick*.

This report outlines the design of the study, describes the nature of the data which were collected, along with some of the key descriptive findings, and summarizes the theoretical findings to date.

THE PANEL SURVEY

Data were collected from children on three successive occasions, in one year intervals, beginning in spring,1981. The sample is summarized in Table 1. At the beginning of the study, 159 second-graders, 163 third-graders, and 217 sixth-graders completed questionnaires. Also, television viewing diaries were completed by 146 second graders, 153 third graders and 208 sixth graders. Roughly the same number of respondents participated in the research during each of the following years. Unfortunately, not all of the children remained in the study throughout the three years, resulting in a smaller number of respondents comprising the panel survey—those children who participated in all three waves of data collection. Attrition was higher for the diaries than for the questionnaires, probably due to the fact that diaries required collecting data from each child for five succesive school days.

Table 1 to appear about here.

Table 1 also summarizes the panel of respondents. In the youngest cohort of the panel, those who were second graders when first surveyed in 1982, there were 85 respondents; in the second cohort, who began the study as third graders, there were 106 children; and in the oldest group, who began in the sixth grade, there were 134 respondents. Viewing diaries were also obtained

during each year of the study from 58 in the youngest cohort, 62 in the second, and 73 in the oldest. As shown in Table 1, there were slightly more boys than girls included in the panel study.

A variety of statistical comparisons between the children who comprise the panel and those who did not remain for the duration the study revealed only slight differences. In general, children in the panel are representative of the entire sample. The remainder of this report, unless otherwise noted, summarizes statistical findings for the three-year panel only, based upon those children who completed questionnaires each year, whether or not they also completed a television viewing diary.

Participating Schools

Respondents were drawn from 9 elementary schools and 5 middle schools located in the San Francisco Bay Area and the Greater Sacramento Area of California. One of the 14 schools was a private, Catholic insitution; the remainder were public. Based on both academic and socioeconomic criteria (percent of children receiving Aid to Families with Dependent Children, average family income levels as estimated by school authorities, etc.) the schools present a wide cross-section of students.

The Survey Questionnaire

During each wave of data collection, trained survey administrators visited the schools to guide children in the completion of a detailed paper-and-pencil questionnaire. Students filled out their questionnaire booklets, not independently, but as part of a class exercise. Given their shorter attention spans, the younger children completed their booklets in several short sessions rather than a single sitting, and in groups of 2 to 5 children.

In general, the same questions—worded identically, with the same response possibilities—were presented to the children during each of the three waves of data collection. A small subset of new questions were added to the study during the second wave (1982) and were

retained on the 1983 questionnaire as well. For each panel respondent, then, approximately 330 variables were collected, and each of these variables was recorded three times—first in 1981, a second time in 1982, and once again in 1983.

Home environment measures. Collected measures included several to gauge important aspects of the child's home environment. These variables included, among others: (1) the persons living at home—parents, guardians, siblings, and so on; (2) home media products owned, such as radios, television sets, computers, and the like; (3) kinds of household chores for which the child is responsible; (4) playtime curfews; (5) family dining habits, including mealtime television viewing, and eating alone or as a group; (6) the child's after-school routine—daycare, babysitting, and the like; (7) the child's use of free time, for example, exercise and sports, lessons, or clubs; (8) the degree to which the TV set is "constantly on" in the house; (9) the child's bedtime; and (10) the usual amount of homework done.

Television viewing habits. A major goal of the study was to investigate children's use of television. Measures taken included: (1) the child's estimate of the total number of hours viewed per day; (2) separate estimates of viewing time on a usual morning, afternoon, and evening; (3) the location of television sets in the home; (4) ways in which the child usually finds out about new shows; (5) ways in which disputes over what to watch are settled; (6) the child's emotional involvement in TV viewing—boredom, excitement, anger, and so on; (7) parent's attitudes toward television; (8) household television-viewing regulations; (9) preferred viewing arrangements—with parents, with friends, or alone; and (10) the child's use of television for learning, for escape, or to relieve boredom.

Reading habits. A wide variety of measures were included to determine the nature of each child's reading habits. Some of the reading variables included: (1) the number of days per week spent reading comic books, non-school books, and magazines; (2) the amount of time spent reading books or magazines in the morning, in the afternoon, or in the evening of a usual school-day; (3) the child's use of reading for learning, escape, and the like; (4) the number of non-

school books read in the last two weeks; (5) various kinds of books—adventure, mystery, sports, romance, and so on—preferred by the child; (6) regularity of visits to school and public libraries; (7) parental attitudes toward reading; (8) the degree of the child's emotional involvement in reading; (9) the amount of mental effort invested in reading; and (10) parent's regulation of the child's reading.

Other questionnaire measures. In addition to information concerning the child's home environment, television viewing patterns and reading habits, the survey included measures of: (1) each child's general attitudes toward schoolwork; (2) favorite, as well as least-liked, academic subjects; (3) the children's confidence in their ability to do many things right; and (4) interest in, and use of, videogames and computers.

Background Variables: IQ and Socioeconomic Status

Due to the policies of the California Board of Education, individual measures of intelligence are unavailable for children in the California school system, and no satisfactory way could be found for estimating individual aptitude. Similarly, school policies prevented the gathering of socioeconomic data for individual children.

As will be discussed in a subsequent section of this paper, the longitudinal design of the study provides a means of accounting for at least part of the influence of background variables. As a validity check, we were able to obtain three indirect measures of socioeconomic status. School principals estimated the income levels of the constituent neighborhoods feeding into each school as lower, lower-middle, middle, upper-middle, or upper class. This scale was then collapsed to form a three-level (low, middle, high) school-based measure of socioeconomic environment. Two additional aggregate measures were used to tap other dimensions of the school environment. One was an economic index based on the percent of students at each school who receive Aid to Families with Dependent Children (AFDC). The other measure was intended to capture the academic character of the school and consisted of average scholastic achievement scores of students in each

school (excluding the classes included in the study). Somewhat suprisingly, the principals' estimates and the AFDC measure are uncorrelated, although both of these socioeconomic variables correlate positively with the school-based scholastic achievement measure.

The Television Viewing Diary

Efforts were also made to obtain more specific information concerning the childrens' television viewing habits. In addition to completing survey questionnaires, students were asked to record their television viewing in detailed diaries. On each successive day of the week during each wave of data collection, trained survey administrators visited the schools to guide children in the completion of a pencil-and-paper TV diary for the previous day. Students filled out their dairies as part of a class exercise, and weekend diaries were completed each Monday morning.

The diaries covered the full viewing day by half-hour segments, beginning at 6:00 a.m. and ending at 11:30 p.m. on weekdays and 12:30 a.m. on weekends. The hours of the schoolday—8:00 a.m. to 2:00p.m.—were omitted. Each student's diary was preprinted with the entire program of show titles (as listed in the local TV guide) as well as channel numbers. For each half-hour the respondent had viewed, he or she was asked to mark the particular program watched, and to indicate whether the show was watched alone, or with brothers and sisters, friends or parents. For the first wave of data collection, viewing diaries were obtained for a full seven-day week; for the second and third waves, diaries were collected for a five-day week, from 2:00 p.m. Wednesday through 8:30 a.m. Monday. For reporting purposes, however, all totals have been converted to daily averages.

General Descriptive Data

Though it is impractical to present complete descriptive statistics of the over 1000 variables collected during the study, a brief, descriptive overview is presented in Table 2.

Provided for each cohort, and at each of the three waves, are frequencies (reported as percentages of affirmative responses) for 14 selected variables.

Table 2 to appear about here.

Nearly all (97%) of the children report living with their mothers, while somewhat fewer (82%) report living with their fathers. As would be expected, the children's reported bedtime grows later with age, and their homework load steadily increases. Less than a third of the eighth graders say they are in bed by 9:00 p.m. And while only half of the second graders report 4 or more days of homework each week, over three quarters of the eighth grade respondents indicate they have that amount of homework.

The oldest children are also more likely to have their own television set, but they appear to watch it a bit less frequently. This is in spite of the gradual relaxation in household rules regarding television watching: over three-quarters of the second graders (78%) report not being allowed to watch certain programs, while less than one-quarter (24%) of the eighth graders report the same restriction. Yet parents' encouragement of their children to watch certain shows declines far less sharply. About half of the sixth graders report that their parents still want them to watch particular programs.

Changes in reading habits are also reflected in Table 2, although the patterns are less easily recognized. Magazine reading shows a steady increase; less than a third (25%) of the youngest children report reading magazines three or more days a week, compared with over two-thirds (68%) of the oldest respondents. And biweekly reading of non-school books appears to show a jump in the oldest children. The daily reading of non-school books, though, appears to decline slightly in the oldest students after peaking around the fifth grade.

TELEVISION VIEWING HABITS

The survey provided three ways of measuring the total time, in hours, spent watching television each day. For those subjects who completed TV viewing diaries, a daily average was computed directly from the number of programs they reported watching. Two additional estimates were gathered from the questionnaires. The first was a single question which simply asked the child to estimate the number of hours usually spent watching television on school days. Efforts were also made to gain a more reliable estimate through three additional questions; one asking for an estimate of usual viewing time in the morning before school, a second requesting an estimate for the time between arriving home from school and dinnertime , and a third asking for an estimate of the hours spent viewing between dinner and bedtime. These three separate estimates were added to form the final measure of daily television viewing.

The three measures yield different estimates, especially for the younger children. The three-item, additive measure from the questionnaire yields—in general—higher estimates than either the single questionnaire item or the diary measure. This is probably due to the fact that respondents' overestimates are compounded through the addition of three separate estimations. All three measures are compared in Table 3, which lists average daily viewing across the three waves of data collection for each cohort. A look at the over-time trend in average hours of daily viewing—regardless of the measure—reveals a downward trend with increasing age.

Table 3 to appear about here.

Table 4 shows the correlations between each of the three measures of total viewing for each cohort and wave. Except for second graders, the two questionnaire measures (one-item and three-item estimates) correlate fairly strongly for each group. The questionnaire measures also correlate reasonably well with the diary total, but only for the older children. This finding

advises some caution concerning the reliability of data gathered from very young children, who may have difficulty both with estimating total times and with remembering what shows they watched.

Table 4 to appear about here.

The three-item, additive measure from the questionnaire correlates best with both of the other two measures. Due to this fact, and because diary measures are only available for a much smaller group of children, findings concerning the amount of television viewing cited throughout this report (unless otherwise noted) are based upon the three-item measure of total daily viewing.

Frequency of Viewing

About two-thirds report that they watch television everyday, and roughly one-third say that they spend 5 or more hours per day watching. However, as Figure 1 shows, the total number of hours watched each day declines with age. Figure 1 provides a look at the frequency of viewing when the total number of hours per day are averaged across the three years of the study. Of the youngest children (cohort one) only seven percent report watching one hour or less a day, compared with 15 percent of the oldest children (cohort three) who report watching television one hour or less a day and 17 percent who report watching two hours. At the other end of the scale, 13 percent of the youngest children, but only 3 percent of the older children, report watching nine or more hours a day. (Note that Figure 1 presents an additive total based on three separate estimates of viewing: in the morning, in the afternoon after school, and in the evening. The addition of the three estimates tends to inflate the overall totals.)

Figure 1 to appear about here.

Types of Programs Watched

The television viewing diaries provide detailed information about the kinds of programs commonly watched by the children. Although it is impractical to present complete descriptive statistics for all of the program preference data, Table 5 provides a summary by general progam type for the shows which the students reported watching most often (reported in daily average number of hours watched for each program type).

Table 5 to appear about here.

For the youngest children, the most popular programs are cartoons, with a daily average of 1.3 hours, followed closely by situation comedies, with an average of just over one hour. By the eighth grade, average daily viewing of cartoons drops to .2 hours and average viewing of situation comedies to .6 hours. The bulk of this decrease occurs between the fifth and eighth grades, which corresponds with the lengthening of the school day and—for many children—an increase in after-school activities. (Both cartoons and re-runs of situation comedies are heavily scheduled during the pre- and after-school hours.)

Action-adventure programs (including police shows) account for another .4 hours per day for the younger children, declining to .2 hours for the older students. The remaining time is divided among the full range of program types, including soap operas, musical variety shows, talk shows, educational programs, movies, magazine-format programs, and so on. It is a bit disappointing, although not particularly suprising, to note that viewing of educational programs, and of the educational channel in general, is exremely rare among all age groups. If programs such

as "Sesame Street" are excluded, educational TV viewing is virtually non-existent among the children in our sample.

Viewing Companions

The diaries also provide data describing the viewing environment at home, in terms of the companions who generally view television along with the children. The most interesting pattern in these data is the generally social nature of most television viewing: between 30 and 50 percent of the time, the children at all ages report viewing television in the company of their parents, and between 45 and 60 percent of the time in the company of other children (siblings and friends). The younger children report viewing alone only 24 to 28 percent of the time, increasing to 35 percent for eight graders.

READING HABITS

The questionnaire administered during each of the three years of the study included a variety of items aimed at measuring reading behavior. Assessing the amount of time children spend reading is somewhat more difficult than determining the amount of time they spend watching television. It is unlikely that children are aware of how much time they actually allot to reading, since printed material, unlike television programing, is not so easily broken into timed units. Consequently, time estimates will prove unreliable. So the frequency of each child's reading was measured in three different ways. First, students were asked how many days per week they had read a book (other than a book for school). Second, they were asked how many books they had read during the past two weeks. A third attempt at measuring the frequency of reading employed three separate questions, each asking how often the child generally read during various times of the day (in the morning before school, in the afternoon between arriving home from school and dinnertime, and in the evening after dinner).

Table 6 shows comparisons among several measures of the amount of reading. At first glance, it seems somewhat suprising that reading frequency measures do not increase very much after the third grade. But there are at least two explanations for this phenomenon. First, the questionnaire items specifically excluded school books; so a child's increasing ability to read may be counterbalanced by a commensurate increase in reading homework. Also, in the later grades, books which might otherwise have been read spontaneously are assigned for homework. Additionally, it is almost certain that the length of the books which are typically read increases rapidly during the grammar school years.

Table 6 to appear about here.

It is also interesting to note that while the measure of reading non-school books holds fairly constant over the cohorts, the measure of magazine reading increases steadily as the child gains in reading skills. Even more pronounced is the pattern of comic book use, which peaks in the third or fourth grade at 35 to 50 percent and then declines until, in the eighth grade, only 11 percent report reading comic books even a single day out of the week.

Other survey questions sought information about the students' taste in reading--how often they read comic books and magazines, and what kinds of reading topics they prefered. Table 7 presents an overview of the kinds of reading material the children select (responses represent the percentage of respondents who report that they "usually read" each type of book).

Table 7 to appear about here.

Humor, mysteries, adventure and fantasy are staples, with a consistently high readership among both boys and girls. Several subject categories illustrate interesting, although not wholly

unexpected, variation with age and between sexes. Sports stories, for example, are clearly more popular with boys, and the difference becomes dramatically larger with age. The same pattern is even stronger in the case of war stories: only a few girls claim to read them during grade school and virtually none in junior high school. For romances, the pattern is the reverse. During grade school, about 25 percent of the girls and 10 percent of the boys report reading romances. Readership among boys drops off in about the fourth grade; while among girls it grows rapidly begining in the sixth or seventh grade, and reaches 70 percent by the eighth grade. Other subject categories—science fiction, fairy tales, and myths, for instance—show similar patterns of consistent differences between boys and girls.

READING ACHIEVEMENT

The Measure of Reading Achievement

The vast majority of students had, as a matter or course, completed the California Test of Basic Skills (CTBS) each year. Two of the schools sampled, however, did not conform to the statewide standard. Instead, one issued the Stanford Achievement Test (SAT), while the other used an examination designed by Science Research Associates (SRA).

Although these three examinations are generally quite similar, they each produce unique scale scores for reading achievement which cannot be directly compared. For this reason, SRA and SAT scores were translated into national percentile rankings for each form (or grade) of these examinations. The percentile rankings were then transformed into CTBS-equivalent scale scores, using comparison tables published in a CTBS guide to test comparisons. Several of the key analyses of relationships between reading achievement scores and other variables have been conducted in parallel, using the CTBS scores alone and comparing the results to analyses in which all scores are used. No significant or systematic differences have been observed.

Print Environment and Print Orientation Measures

A number of survey questions drove at some of the uses children make of their reading material (e.g., reading for pleasure or to learn, reading out of boredom, cognitive and emotional involvement in reading, and the like). Several other questions sought to determine the amount of parental encouragement for reading, including some aimed at determining how often books are discussed with parents, how commonly books are recieved as gifts, whether magazines are purchased especially for the child, how often the library is used, and so on.

Table 8 shows the bivariate relationships of some of these print environment and orientation variables with children's reading achievement. One clear relationship is that between the availability of reading material in the home and the child's reading achievement. Although the correlations between print availability and reading scores are weak or absent in the earlier grades, as the child grows a pattern of consistently positive and significant correlations emerges: the more print available within the home, the better the child reads.

Table 8 to appear about here.

A more obvious relationship is that between reading achievement and frequency of reading. For the two measures of reading frequency presented in Table 8 (the number of non-school books read in the past two weeks, and the number of days per week a child spends reading books other than those for school), the correlation with reading achievement is consistent, positive and large. As would be expected, the correlations tend to be larger during the later school years.

Finally, three measures of a child's orientations toward reading are reported in Table 8. The degree to which a student is involved in reading—the extent to which the child is "caught up" in the process—is even more strongly related to reading achievement than is the amount of material read. Reading for pleasure, because it is "fun" or "exciting," also correlates strongly and positively with reading scores in virtually every group; and this relationship, like the others,

seems to grow stronger in the later years. The relationship between reading achievement and the amount of mental effort the student invests in reading—esssentially, how "hard" a child finds reading to be—is relatively weaker, although still positive. This may reflect changes in reading material over the years: children who take on more difficult reading may report a high level of mental effort, along with those children who experience difficulty with reading in general.

READING ACHIEVEMENT AND TELEVISION VIEWING

The Basic Relationship

As we noted, previous studies of the television-reading achievement relationship have generally concluded that there *is* a relationship—although the results have often been ambiguous, and when controls are added for exogenous factors, the relationship appears to be weak. Our data, under both cross-sectional and longitudinal analysis, again demonstrate a relationship, even when controls are added for exogenous factors.

Table 8 shows bivariate correlations between reading achievement scores and several measures of television use. The most direct relationship—and the strongest—is the correlation between the daily hours of television viewing and reading achievement. The coeffiecients increase from around -.30 in the first five grades to -.50 and -.44 in the seventh and eighth grades. Relationships between reading scores and other measures of television use—watching TV as a default, or because there is nothing else to do, and using TV as an escape or to learn—are somewhat lower, although still consistently negative.

As Hornik (1981) notes, once controls are introduced for IQ and socioeconomic status (SES), the relationship between television use and reading achievement often attenuates or disappears. Due to policies in California schools, we lack precise measures of IQ and SES. However, the longitudinal design of our study enabled us to use first-year reading scores as a baseline measure to control for most exogenous factors that may cause spurious correlations

between television viewing and reading achievement. While this control does not account for the possible effect of IQ on the rate of change in reading development, it does account for initial differences in reading proficiency due to intelligence and the entire array of factors that may be lumped together under the SES label.

In a series of analyses discussed in detail in Ritchie, Price and Roberts (1985), we found a consistently significant and strong relationship between television use and subsequent reading achievement scores for the third cohort (grade 6 in the first year of the study) but not for either of the younger cohorts. We tested nine relationships for each cohort: time one TV use to time two reading achievement, time one TV use to time three reading achievement, and time two TV use to time three reading achievement, for each of the three measures of television use. For each lagged correlation, time one reading achievement scores were controlled. Eight of the nine coefficients of partial correlation significant for the oldest children, ranging from $r = -.21$ ($p < .05$) to $r = -.39$ ($p < .001$). With the exception of an anomolous time one to time three lag using the diary measure, all of the coefficients are similar, regardless of the measure of TV viewing.

For the youngest cohort, many of the coefficients were positive, one significant in the positive direction. For the second cohort, all of the coefficients were negative, but only three were statistically significant. While these findings may indicate a lack of relationship for the younger children, they may just as easily be interpreted as an indication that the younger children are unable to give accurate self-reports of their own viewing behavior. Finally, the findings may simply be masking a significant, curvilinear relationship, as proposed by Williams et al. (1982) and Morgan and Gross (1982).

As reported in Ritchie, Price and Roberts (1985) we also tested the hypothesis of curvilinearity. In brief, although we found some evidence of curvilinearity for the younger children (those for whom we have some reason to doubt the reliability of self-report data), we found no evidence whatsoever of curvilinearity for the older children. Furthermore, the two younger cohorts, only one year apart in age, showed radicaly different patterns. For the youngest

cohort, a cosine function (sloping upward for zero to three hours of viewing, downward to six hours, then upward again) provided the best fit. For the second cohort, one year older, a squared function provided the best fit. We can think of no theoretically valid reason why a single year in age should make such a large difference in function. Furthermore, upon visual inspection of the data, it became apparent that a small number of outliers were responsible for the apparent curilinearity. We are thus forced to conclude that there is no evidence of curvilinearity in the data.

Cross-sectional Regressions

In a study based on cross-sectional analysis of the first wave of data, Roberts et al. (1984) found that school and community characteristics decline in importance as predictors of reading achievement, while media use variables increase in importance as the child grows older. These findings were replicated through cross-sectional analysis of each of the subsequent waves of data. In spite of slight modifications in the analytic techniques, the results corroborate the initial findings and conclustions.

Parallel regression analyses were conducted for a smaller set of variables (in which only the strongest variables within each of the five constructs were included) and for the same full set of 28 variables using only panel members. Both analyses yielded results comparable to those discussed below. The more extensive cross-sectional regressions are reported, first, because of the larger number of respondents; and, second, in order to preserve a maximum degree of continuity with the findings reported in the preliminary study.[1]

The results of the regression analyses for each grade at each of the three waves of data collection are presented in Table 9. Variables comprising each of the five influential constructs were entered into the regression equation simultaneously in individual blocks. The predictive capability of the entire set of variables is estimated by the R^2 statistic, which measures the proportion of total variance in reading achievement which can be accounted for by a linear

combination of the independent variables in the equation. Also shown in Table 9 is an adjusted R^2, which is computed by "penalizing" for a large number of predictor variables. The predictive contribution of each block of variables is gauged by the extent to which the addition of that block increases the equation's predictive power, measured essentially by the increase in R^2 (indicated by ΔR^2) accounted for by that particular block.

Table 9 to appear about here.

The general trend, as reported in the initial study, is marked by the declining influence of school and community characteristics and a corresponding increase in the influence of media use variables as the child matures. In our sample, social, economic and school characteristics accounted for 34% of the variance in reading scores during the second grade, falling to 7% in the eighth. In the second grade, all of the other variables in the model account for only 8% of the variance in reading achievement; by the eight grade, these same variables account for 20% of the variance. The general decline in the adjusted R^2 is due principally to the declining influence of social-environmental characteristics on the child's reading achievement.

The home media environment—parental attitudes toward television and reading, regulation of the amount and type of media use, the availability of print in the home, and so on—seems to have a negligible effect, beyond that of the socio-economic and academic characteristics of the school. To the extent that there is an effect, it seems to be strongest during the later years of grade school (when, as we know from previous studies, parents seem to exercise the greatest amount of control over media use, in particular over content.)

From Table 9, it also appears that the amount of television viewing has a consistent but fairly week relationship with reading achievement. (When a smaller subset of predictor variables was used, this relationship was strengthened only slightly; it appears that the socio-economic background of the students, as estimated by the school principals, represents a group of

influences affecting both television use and reading achievement. Once television viewing has been "adjusted" for its covariance with this measure, then, relatively little covariance with the dependent variable remains.) The relationship between the amount a child reads and reading scores is somewhat stronger. For both television use and print use, the relationship is quite weak during the early years of school, but becomes relatively stronger during later years.

The concepts earlier described as orientations toward television and reading—motives for using one or the other, as well as the mental effort expended using either medium—appear to have a moderate relationship with reading achievement during the middle years of grammar school (fourth through sixth grade), but a weak or nonexistent relationship during the first two or three years and the later, junior high school years.

Finally, the media involvement variables—the extent to which a child is cognitively and emotionally engaged with the media—although they seemed quite promising predictors given their bivariate relationships with the dependent variable, seem in these analyses to have virtually no relationship with reading achievement.

Although regression analysis can be a powerful research tool, it has great limitations, which should be recognized when interpreting these results. Chief among the limitations is a tendency to give undue weight to those variables introduced earlier in an analysis, relative to those introduced later. The focus in regression analysis lies in locating the combination of variables which will best predict the dependent variable—not in theoretically explaining it. In these data, the principals' estimate of the socio-economic class of their school's feeder neighborhoods is, for all groups of children up to the eighth grade, the single most powerful predictor of reading achievement; it tends to over-shadow other predictors. Very likely, some of what is measured by this variable is the tendency of children from wealthier neighborhoods to have more printed materials avialable to them, to receive more adult supervision, and so forth.

It should also be noted that the full model, including all of the predictor variables, accounted for at most about one half of the variance in reading achievement scores and—for the older

children—as little as one fourth. The remaining half to three-fourths of the variance is not accounted for by the predictive model.

With these reservations in mind, some tentative conclusions can be drawn from the findings. It appears that family background, and school and community characteristics (much of what is commonly implied by the term "socio-economic status") play a major role in determining reading achievement during the early years, and a gradually declining role in later years. The child's orientation toward media—in particular toward print—and the amount the child actually reads, on the other hand, seem to play an increasingly important (but still moderate) role.

CURRENT RESEARCH OBJECTIVES

The analyses reported here suggest that television viewing does have an effect on reading, albeit a fairly small one. The next stage in our research program is to investigate specific processes which may mediate the relationship between television viewing and reading achievement, and to identify specific populations of children who may be particularly affected.

The Displacement Hypothesis

One of the more intuitively appealing hypotheses for explaining the television viewing-reading achievement relationship is the displacement hypothesis. In its simplest form, the *quantitative* displacement hypothesis states that an hour watching television is an hour not spent reading. The more television a child watches, the less the child reads. This reduced reading practice time retards the child's development of reading skills. A somewhat more subtle form is the *qualitative* displacement hypothesis, which states that watching television has an adverse effect on the quality of a child's reading practice: either the child reads a different type of book, or the child invests less emotional and cognitive effort in reading, and hence gains less benefit from the time that is spent reading.

Using the data from our sample, Ritchie, Price and Roberts (1985) tested both forms of the displacement hypothesis, and they found little support for either. For the quantitative version, they found that television use is weakly related to reduced amounts of non-school reading, but that non-school reading is not related to subsequent reading achievement, once controls are applied. On the other hand, while there does seem to be a slight relationship between qualitative measures of non-school reading (reading for pleasure, mental effort invested in reading, reading involvement) and subsequent reading achievement, television viewing is not related to these qualitative measures.

Based on his review of the literature, Hornik (1981) had suggested that, if television displaces any out-of-school reading, it ought to be comic books (which are assumed to be functionally equivalent to television viewing). Ritchie et al. tested this possibility separately, and found that comics reading appears to be unaffected by the amount of television use and, in turn, has no relation to subsequent reading achievement.

The Effect of Television on Attitudes Toward School

Another hypothesis suggested by Hornik's (1981) review of the television effects literature is the hypothesis that television watching tends to make children impatient with the pace of schooling, which in turn adversely affects school performance. We have a number of scales and individual variables that are relevant to this hypothesis, and our research team is currently engaged in an investigation of the relationship between television viewing and attitudes toward school. Preliminary results suggest that the amount of television viewing is related over time to lower satisfaction with school and to greater frustration with school, even under controls for earlier levels of satisfaction and frustration. But the relationship must be sorted out further. Certainly a number of other factors play an important part in shaping *both* attittudes toward school and television viewing. We have found, for example, that children who watch more

television report having less homework assigned, and we are continuing to investigate this relationship.

DIRECTIONS FOR FUTURE RESEARCH

The analyses reported here suggest that television viewing may indeed have an effect on reading achievement, albeit a fairly small one. This effect does not appear to be explainable in terms of a simple displacement of reading by time spent in front of the television set, nor in terms of a television-induced reduction in the quality of reading material chosen by the child. While there may exist certain groups of children for whom one or both of these effects is operative, we have found no evidence of a generalized displacement effect in our sample.

The next logical stage in our research program is to investigate specific processes which may mediate the relationship between television viewing and reading achievement, and to identify specific populations of children who may be particularly at risk.

The Home Environment, Socialization and Media Use

The data from our sample provide a detailed picture of the child's social surroundings at home via measures of family communication patterns, household rules and regulations, family dining habits, various parental attitudes, playtime activities, and so on. The analyses completed to date suggest that the home media environment (e.g., parental attitudes toward media use, media availability, etc.) does not have a strong direct effect on reading achievement. However, we believe that the home media environment figures in very complex relationships with television viewing behavior, recreational reading, and reading achievement. Future analyses will be directed toward developing a general model of these relationships.

The Influence of New Communication Technologies

In addition to the continuing concern with the role of television in the intellectual development of children, there has also been widespread speculation concerning the possible influence of newer communication media—such as videogames and personal computers—on child development. Though we have, in this report, focused entirely on the relationship between television and reading achievement, the data also include a large set of questions about computer and videogame ownership and use. Since the data were collected during a period when microcomputers were finding their way into American homes and schools in ever-increasing numbers, they should provide a basis for developing a better understanding of children's computer use and its effect on the development of reading skills. Group comparisons (using a variety of dependent measures) of in-school and out-of-school computer users, videogame and computer owners versus non-owners, and programmers versus non-programmers have already begun. Findings to date suggest that children's involvement with these new media may affect their use of other media as well as their achievement in school.

Developmental Changes in Reading and Television Use

As noted earlier, a key assumption guiding the research was that a child's developmental progress in both reading and television viewing would have profound implications for the nature of the television and reading relationship. The cross-sectional analyses reported here, along with those reported earlier by Roberts et al. (1984), indicate that predictors of reading achievement do vary depending on the child's age and consequent stage of reading development. In the youngest children, school, social and community characteristics show the greatest influence on reading scores; but that influence declines as the child matures. Corresponding with the declining influence of these community characteristics, media use variables exert an increasing amount of influence in the older children. As we work to develop more sophisticated over-time models for causal analysis, we plan to continue tracking these key developmental changes.

NOTES

1. Differences between the present findings and those published earlier are due, first, to the introduction of two additional estimators of socio-economic environment; and, second, to modification of the dependent variable. Complications in comparing results of the three separate reading exams (CTBS, SAT, SRA) lead to the computation of a CTBS-equivalent scale score for each child, a procedure which was conducted subsequent to the initial regression analysis.

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TABLE 1

Composition of the Panel Survey Across Three Years of Data Collection

		First Cohort Grades 2-3-4		Second Cohort Grades 3-4-5		Third Cohort Grades 6-7-8	
		Quest.	Diaries	Quest.	Diaries	Quest.	Diaries
Cross-Sections:	1981:	159	146	163	153	217	208
	1982:	155	150	173	167	253	204
	1983:	156	123	183	132	207	141
Panel: (81-83)	Total:	85	58	106	62	134	73
	Boys:*	46	(54%)	60	(57%)	79	(59%)
	Girls:	39	(46%)	46	(43%)	55	(41%)

* Breakdown by sex shown for the panel of questionnaire respondents only.

TABLE 2

Responses on Selected Survey Items *

	First Cohort			Second Cohort			Third Cohort		
Wave:	1	2	3	1	2	3	1	2	3
Grade:	2	3	4	3	4	5	6	7	8
Live with mother	97%	95%	95%	98%	98%	95%	96%	93%	97%
Live with father	81	81	85	82	83	82	81	77	80
Bedtime before 9 pm	71	72	53*	86*	54*	42*	42	46	29*
Homework 4 or more days/wk	50	55	58	34†	58*	67*	76†	86*	77*
TV in child's room	19	24	29	26	32	37	33	36	38
Watch TV everyday	65	73	66	68	65	64	46†	52	53
5 or more hrs/day of TV watching	19	35*	37	30	44*	42	34†	22	25
Some TV shows not allowed	78	75	71	71	66	60	46†	39	24*
Limits on time spent watching TV	65	29*	17*	20	17	17	14	19	10*
Parents want child to watch certain shows	67	66	69	65	66	69	60†	60	49*
Own a library card	46	61*	70	61	64	64	71†	71	70
Read non-school books 3 or more days/wk	42	48	54	56	60	59	53	46*	36*
Read magazines 3 or more days/wk	25	33*	41*	36	48*	52	40†	66*	68
At least 3 or 4 books read in last 2 weeks	67	66	68	66	69	77	87†	89	90

* Reported frequencies are the percentage of affirmative responses. Standard errors are approximately 6% for cohort one (N=85), 5% for cohort two (N=106), and 4.5% for cohort three (N=134).

* Significant difference ($p < .05$) within cohorts.

† Significant difference ($p < .05$) between cohorts.

TABLE 3

Three Estimates of Total Hours of Daily TV Viewing

	First Cohort			Second Cohort			Third Cohort		
Wave:	1	2	3	1	2	3	1	2	3
Grade:	2	3	4	3	4	5	6	7	8
Ave. daily total from diary	5.5*	4.1	4.1	4.7	3.3	3.7	3.4	3.0	2.4
Single-item estimate	2.9	3.7	4.0	3.9	4.1	4.0	3.8	2.8	3.1
Three-item measure	5.6	5.7	5.7	5.9	5.7	5.1	4.5	3.6	2.9

* All frequencies represent hours viewed per day.

TABLE 4

Bivariate Correlations between Measures of TV Viewing

	First Cohort			Second Cohort			Third Cohort		
Wave:	1	2	3	1	2	3	1	2	3
Grade:	2	3	4	3	4	5	6	7	8
One-item with Three-item	.30*	.64'	.69'	.50'	.61'	.75'	.80'	.83'	.77'
One-item with Diary total	.31*	.23*	.26*	.43'	.29*	.40'	.65'	.44'	.39'
Three-item with Diary	.64'	.31*	.32*	.54'	.48'	.49'	.64'	.44'	.42'

* Significant at level $p < .05$.

* Significant at level $p < .01$.

' Significant at level $p < .001$.

FIGURE 1

Television Viewing for Each Cohort
(Daily Hours of Viewing Averaged over Three Years)

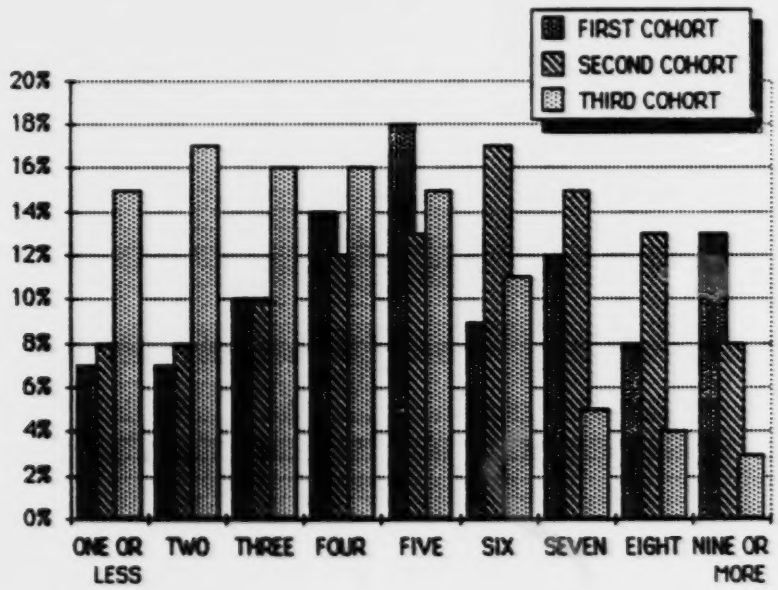

TABLE 5

Television Programs Viewed by General Type

	First Cohort			Second Cohort			Third Cohort		
Wave:	1	2	3	1	2	3	1	2	3
Grade:	2	3	4	3	4	5	6	7	8
Cartoons	1.34*	1.09	.95	1.21	.76	.76	.63	.45	.21
Other children's shows	.43	.14	.24	.34	.11	.15	.20	.08	.07
Situation comedies	1.04	.54	.71	1.10	.53	.71	.98	.51	.59
Action-adventure	.35	.38	.38	.28	.32	.38	.22	.22	.22
Soap operas	.11	.07	.10	.13	.02	.02	.05	.04	.03
News	.16	.16	.13	.14	.10	.12	.11	.13	.09
Movies	.24	.55	.60	.20	.46	.42	.24	.60	.28
Miscellaneous (game shows, etc.)	1.81	1.10	1.10	1.40	1.00	1.00	1.00	1.00	1.00
Total	5.50	4.10	4.10	4.70	3.30	3.70	3.40	3.00	2.40

* All frequencies represent hours viewed per day.

TABLE 6

Comparison of Several Measures of Frequency of Reading

	First Cohort			Second Cohort			Third Cohort		
Wave:	1	2	3	1	2	3	1	2	3
Grade:	2	3	4	3	4	5	6	7	8
Days per week spent reading mags. or non-school books	2.1*	2.7	2.9	2.7	3.1	3.3	2.7	3.3	2.8
Median number of non-school books read in last 2 weeks	3	3	3	5	3	2	3	1	1
Median days per week spent reading magazines	0	1	2	1	2	3	2	4	3
Rate of reading per day scale (from 0=low to 3=high)	1.0	1.7	1.6	1.2	1.8	1.7	1.4	1.7	1.5
Percent who read comic books at least one day a week	27%	48%	38%	30%	34%	29%	25%	18%	11%

* Note that each number of the table represents a different unit of measurement (e.g. days, percents, etc.).

TABLE 7

Book Topics which are "Usually Read"*

		First Cohort			Second Cohort			Third Cohort		
Wave:		1	2	3	1	2	3	1	2	3
Grade:		2	3	4	3	4	5	6	7	8
Humor		11%	46%	38%	16%	37%	50%	50%	53%	50%
Mysteries		25	66	68	28	68	67	53	66	63
Adventure		19	58	58	32	68	70	54	70	62
Fantasy		14	41	42	23	40	47	43	51	40
Science Fiction	Boys	24	44	50	27	48	48	43	52	52
	Girls	3	26	26	26	21	23	13	26	25
Romance	Boys	4	9	11	9	2	10	3	9	8
	Girls	8	24	26	13	26	36	31	66	70
Sports	Boys	24	59	63	34	66	62	53	60	58
	Girls	13	47	23	23	36	30	29	22	15
Fairy tales	Boys	15	35	26	15	29	21	14	10	6
	Girls	36	79	51	49	40	36	24	26	17
Myths	Boys	13	48	35	15	43	43	33	41	22
	Girls	8	37	33	19	45	26	24	26	15
War	Boys	17	52	39	24	47	45	37	47	42
	Girls	13	11	5	4	9	9	2	0	4

* All frequencies are percentages of affirmative responses. Standard errors are approximately 6% for cohort one (N=85), 5% for cohort two (N=106), and 4.5% for cohort three (N=134).

TABLE 8

Selected Bivariate Correlations with Reading Achievement Scores

	First Cohort			Second Cohort			Third Cohort		
Wave:	1	2	3	1	2	3	1	2	3
Grade:	2	3	4	3	4	5	6	7	8
Print Availability at Home	-.03	.16	.00	.26*	.20*	.30†	.16*	.39†	.19*
Books Read Last Two Weeks	.04	.06	.05	.25*	.31*	.32†	.27†	.23*	.22*
Days/week Reading Books	.20*	.22*	.14	.23*	.46†	.39†	.29†	.34†	.40†
Involvement in Reading	.39†	.24*	.18	.32†	.40†	.36†	.34†	.39†	.38†
Using Reading for Pleasure	.28*	.15	.26	.16	.35†	.45†	.28†	.50†	.38†
Mental Effort in Reading	.03	.19*	.20*	.10	.22*	.22*	.25*	.10	.21*
Daily Hours of TV Viewing	-.27*	-.21*	-.22*	-.34†	-.41†	-.40†	-.34†	-.50†	-.44†
Watching TV as a Default	-.16	-.36†	-.46†	-.27*	-.24*	-.13	-.17*	-.30†	-.08
Using TV to Learn	-.35†	-.27*	-.25*	-.16	-.14	-.19*	-.03	-.15*	-.11
Using TV for Escape	-.26*	-.10	-.10	-.13	-.17*	-.19*	-.09	-.20*	-.31†

* Significant at level $p < .05$.

* Significant at level $p < .01$.

† Significant at level $p < .001$.

TABLE 9

	First Cohort			Second Cohort			Third Cohort		
Wave:	1	2	3	1	2	3	1	2	3
Grade:	2	3	4	3	4	5	6	7	8
	R^2 (R^2_{adj})								
All Variables:*	.51' (.41)	.47' (.35)	.41' (.29)	.52' (.42)	.52' (.42)	.41' (.30)	.53' (.46)	.40' (.32)	.32' (.22)
	R^2 (ΔR^2)								
Hierarchical Blocks:									
Socio-Economic Environment	.35 (.35)'	.27 (.27)'	.14 (.14)'	.32 (.32)'	.17 (.17)'	.14 (.14)'	.17 (.17)'	.12 (.12)'	.07 (.07)*
Home Television Environment	.38 (.03)	.30 (.03)	.19 (.05)	.35 (.03)	.23 (.05)'	.18 (.04)	.22 (.06)*	.18 (06)*	.09 (.02)
Home Reading Environment	.40 (.03)	.30 (.00)	.19 (.00)	.36 (.01)	.29 (.07)*	.20 (.02)	.24 (.02)	.20 (.02)	.12 (.03)'
Amount of TV Viewing	.40 (.00)	.32 (.02)	.20 (.01)	.36 (.00)	.32 (.03)*	.24 (.04)*	.27 (.02)'	.21 (.01)	.19 (.07)'
Amount of Reading	.41 (.00)	.35 (.03)	.27 (.07)*	.38 (.02)	.38 (.06)*	.29 (.05)*	.36 (.09)'	.29 (.08)'	.26 (.08)'
Television Orientations	.46 (.05)'	.42 (.08)*	.34 (.07)'	.42 (.04)	.42 (.03)	.35 (.05)'	.41 (.05)*	.32 (.03)	.28 (.01)
Reading Orientations	.48 (.02)	.43 (.01)	.40 (.06)'	.51 (.09)'	.50 (.08)'	.40 (.05)'	.46 (.06)'	.37 (.05)*	.30 (.02)
Television Involvement	.50 (.02)	.46 (.03)	.40 (.00)	.52 (.01)	.50 (.00)	.41 (.01)	.51 (.05)'	.39 (.02)	.32 (.02)
Reading Involvement	.50 (.01)	.47 (.01)	.41 (.01)	.52 (.00)	.52 (.02)	.41 (.00)	.53 (.01)	.40 (.01)	.32 (.01)

* For cohort one, N's are 159 (W_1) 155 (W_2) and 156 (W_3). For cohort two, N's are 163 (W_1) 173 (W_2) and 183 (W_3). For cohort three, N's are 217 (W_1) 253 (W_2) and 207 (W_3).

' Significant at level $p < .05$. * Significant at level $p < .01$. ' Significant at level $p < .001$.